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## MOBILE MEDICAL IMAGING SYSTEM AND METHODS

### CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of U.S. application Ser. No. 12/576,681, filed Oct. 9, 2009 and claims the benefit of U.S. Provisional Application No. 61/142,494, filed Jan. 5, 2009.

### STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

N/A

### BACKGROUND OF THE INVENTION

The present invention is in the technical field of medical imaging, including, for example, mobile computed tomography and magnetic resonance imaging devices.

Conventional computed tomography (CT) and magnetic resonance (MR) imaging devices, are typically either immovable or exceedingly difficult to transport and consist of multiple components including the imaging gantry and a separate imaging table. It is difficult to move these devices throughout a hospital because they have not been designed to fit through standard hallways and the imaging table top is unusable or unfit for procedures other than standard diagnostic imaging or do not allow imaging with the patient in a sitting position. In addition, a separate single procedure specific table top is generally indexed to translate into and out of the imaging device throughout a procedure thus limiting its practical applications beyond diagnostic imaging. Moving such devices typically requires several strong persons, or a sturdy wheeled vehicle such as a reinforced wagon or hand cart. The difficulties of moving such a device throughout a hospital or office are multiplied when the device needs to be moved from one floor to another. Further, it is not an uncommon experience to realize that the device cannot pass through the doorway without its widening. Further, the devices cannot readily be moved from spot to spot once inside a room.

### BRIEF SUMMARY OF THE INVENTION

In accordance with the present invention, an easily transportable mobile medical imaging device is disclosed. The mobile medical imaging device allows for multiple procedural support structures, such as a surgical table or a seat, to be attached. An imaging gantry is provided that is indexed to the patient by translating up and down the patient axis. In a preferred embodiment, the imaging gantry can translate, rotate and/or tilt with respect to a support base, enabling imaging in multiple orientations, and can also rotate in-line with the support base to facilitate easy transport and/or storage of the device. The imaging device can be used in, for example, x-ray computed tomography and/or magnetic resonance imaging (MRI) (magnetic resonance) applications.

According to one embodiment, a medical imaging system comprises a base; a pedestal mounted to the base; a gimbal support mounted to the base; and a gantry ring that is attached to the gimbal support and is suspended above the top surface of the base. The gantry ring includes an image collection apparatus, such as an x-ray source and an x-ray detector array, for obtaining image data from an object located within the bore of the gantry ring. The gantry ring can translate in a first direction relative to the base and rotate at least about 90

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degrees with respect to an axis extending generally normal to the top surface of the base. In certain embodiments, the gantry ring can also tilt with respect to the gimbal support.

The gimbal support can be a generally U-shaped support having arms extending upwards from the base and connecting to opposite sides of the gantry ring. The gimbal support can translate and rotate with respect to the base in order to translate and rotate the gantry ring on the base. The base is preferably a mobile base having one or more wheels attached to the base.

The imaging system can further comprise a tabletop support mounted to and disposed above the pedestal, the tabletop support extending at least partially into the bore of the gantry ring. The tabletop support can support an object, typically an individual or an animal to be imaged. The tabletop support can be detachable from the pedestal, and the pedestal can be adapted to support any one of a plurality of interchangeable tabletop supports, including, for example, surgical or trauma tables, modular tabletops, and chairs for imaging of a seated patient. The system can include means for adjusting the height of the tabletop support relative to the base, as well as for translating the tabletop support in one or more directions relative to the pedestal.

The gantry ring can have a relatively large imaging bore having a diameter greater than about 38 inches and generally between about 40 and 50 inches. The overall dimensions of the gantry ring are generally relatively small in order to improve the portability of the system. For example, the outer diameter of the gantry is generally less than about 70 inches and the width of the gantry ring is typically about 17 inches or less.

In certain embodiments, the gantry ring rotates with respect to the base between an imaging position, in which the bore of the gantry ring is faced generally in the direction of the pedestal, and a transport position, in which the bore is faced generally perpendicular to the pedestal and in-line with the base. By rotating the gantry ring into the transport position, the overall width of the system is reduced, which allows for easier transport of the system through doors and hallways.

The present invention further includes methods of imaging an object using an imaging system as described above.

### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Other features and advantages of the present invention will be apparent from the following detailed description of the invention, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a side view of a mobile imaging system of the invention;

FIG. 2 is a front view of the imaging system of FIG. 1;

FIG. 3 illustrates an imaging system including a tabletop support supporting a patient and the gantry ring tilted and partially rotated relative to the base;

FIG. 4 is a side view of an imaging system with the gantry ring and gimbal support translated to the distal end of the base;

FIG. 5 is a side view of the imaging system of FIG. 4 with the gantry ring and gimbal support translated to the pedestal side of the base;

FIG. 6 is a side view of an imaging system with the tabletop support vertically displaced from the pedestal and the gantry ring tilted in a first direction with respect to the gimbal support;